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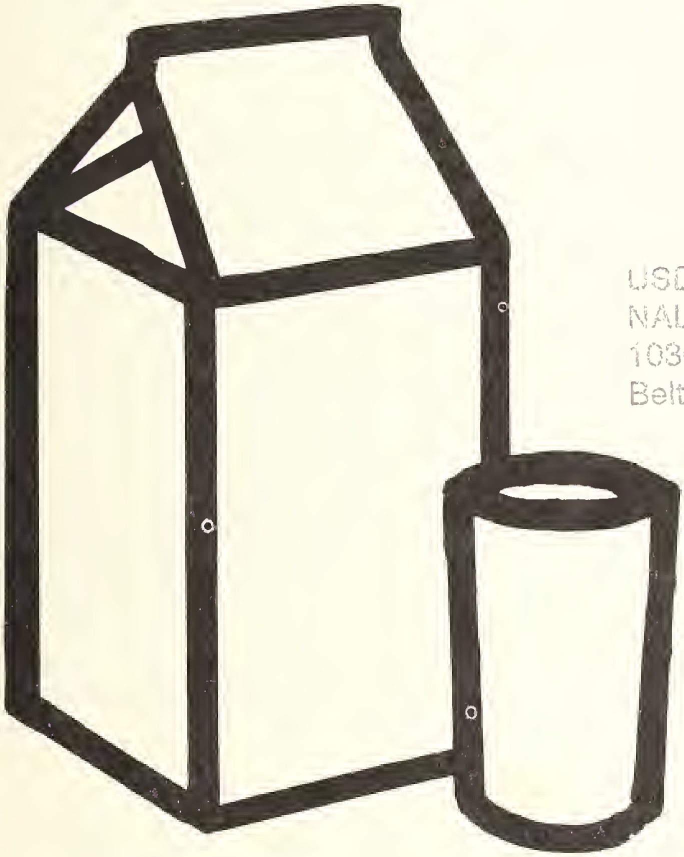
THE EFFECT OF DIFFERENT LEVELS OF PROMOTIONAL EXPENDITURES ON SALES OF FLUID MILK



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PREFACE

This study was done in cooperation with the American Dairy Association, a voluntary organization supported by farmers, to provide research results to help appraise and improve their promotional efforts. The study is one of a group conducted by the U.S. Department of Agriculture to help farm groups expand markets for their products.

This is a preliminary report to give the industry the principal findings of the study as soon as possible.

Dr. Gerald G. Quackenbush, Director of Market Research of the American Dairy Association, participated in all phases of the study and provided many insights that were helpful in designing the research. He also assumed the major role of maintaining close liaison between the Association and its promotional group and the Department. Research executives of the Dupont, Ford, and Pet Milk Companies and some university personnel reviewed the research design and offered helpful suggestions for its improvement.

James F. Hind and Sidney E. Brown, agricultural economists, Marketing Economics Division, USDA, were primarily responsible for the analysis of historical data used in planning the research and participated in designing the study. (Mr. Hind has since left the Division.)

Milk Market Administrators and their assistants in each of the markets used in this study cooperated by furnishing data on sales of milk in each market. They also helped to provide an economic and marketing profile of each market to aid in planning and carrying out the research. H.L. Forest and H.C. Fedderson of the Dairy Division of the Consumer and Marketing Service, USDA, participated in the early discussions of the project and gave permission for cooperation of Milk Market Administrators and use of the Federal Milk Order Data. Keister Adams, Agricultural Stabilization and Conservation Service, USDA, helped in the preliminary investigation of markets for the study and provided insights into the nature of the Market Order data. R.J. Lemmon, Administrator of the State Order Market in Rochester, N.Y., rendered invaluable assistance in providing sales data and other information on that market. Many retailers and milk handlers in each of the markets cooperated by making available information that was needed in the analysis. We acknowledge and thank all of these persons for their assistance.

The study was conducted in the Market Development Branch of the Marketing Economics Division under the general direction of William S. Hoofnagle.

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Washington, D.C. October 1965

SUMMARY

In a controlled experiment conducted over a 2-year period, significant relationships were found between promotional expenditures and sales of fluid milk. The experiment was conducted in one State and five Federal Milk Order Markets in cooperation with the American Dairy Association. Three levels of expenditure were tested--the present level of promotion by the Association (2 cents per capita annually), a medium level of promotion (15 cents per capita annually above present levels), and heavy promotion (30 cents per capita annually above present levels). Both levels of increased promotional expenditure increased sales of fluid milk to a statistically significant degree but they were not equally profitable. The medium level increased sales by an average of 13,000 pounds per day per market, or 4.5 percent, and heavy promotion increased sales by an average of 17,000 pounds per day per market, or 5.9 percent. These increases include the immediate effect of promotion and the enduring influence which carried over into the 6-month period immediately following promotion.

The added revenue to dairy farmers from the medium level of promotion was $398,580. This figure represents the increased quantity of milk sold multiplied by the weighted average price differential between Class I and Class II milk in the six markets used in the study. The cost of achieving this increase--the total amount spent for the medium level of promotion--was about $237,530. Thus the net return to farmers was $161,050, a return of 68 percent on their investment. The heavy level of promotion cost $436,313 and produced $521,220 in revenue. The net profit was $84,907, a 19-percent return on the amount invested. Thus, of the two levels of expenditures considered, the medium level was optimal.

It should be noted that the net returns on the added promotional investments depend on the difference between Class I and Class II prices received by producers for delivered milk. These differentials, of course, vary considerably between markets, in some instances being higher than the differential used in this study and in other instances being lower. For the cities used in this study, the weighted break-even price differential, the price difference required before a profit is made, was $1.32 per hundredweight for the medium level of promotion and $1.85 per hundredweight for the heavy level. The break-even price will also vary among markets, depending upon per capita promotion costs and per capita consumption. All of these factors play an important role in appraising the profitability of promotion.

A part of the normal promotional effort is directed at obtaining trade cooperation and support of the program. It was hypothesized that the added promotion might affect the level of promotion by the trade. However, the main support given by retailers was in the form of distributing and displaying instore merchandising materials. The use of point-of-purchase materials for fluid milk increased 32 percent during the medium level of promotion and over 85 percent during heavy promotion. Overwires and case strips were the

major types of promotional materials displayed. Retailers did not advertise fluid milk extensively during any of the promotional periods.

Interviews with milk handlers in each market indicated that during the period of medium promotion, some handlers (7 out of 40) increased their promotional expenditures for all products by about $16,000, 6 percent over their normal expenditures. During the period of heavy promotion, 4 out of 42 handlers interviewed reported increasing promotional expenditures by $3,100--a modest amount when viewed in relation to the size of their normal expenditures. Practically all of the handlers indicated that they cooperated in the program by distributing and putting up the Association's point-of-purchase materials in retail outlets. The main reasons milk handlers gave for not increasing expenditures during the Association's promotion were (1) budgets that, being established far in advance, could not readily be altered, (2) lack of authority on the local level to change the promotion budget, and (3) lack of funds.

THE EFFECT OF DIFFERENT LEVELS OF PROMOTIONAL EXPENDITURES ON SALES OF FLUID MILK

by
Wendell E. Clement, Peter L. Henderson, and Cleveland P. Eley
agricultural economists
Marketing Economics Division
Economic Research Service

CONSUMPTION PATTERNS FOR DAIRY PRODUCTS

Consumption patterns for dairy products have changed considerably during the post World War II period. Per capita consumption of some products--cheese, frozen desserts, skim milk, and nonfat dry milk--has been increasing. But per capita consumption of other products such as fluid whole milk, cream, butter, and evaporated milk has declined. The net result of these changing patterns of consumption is a decline in the total per capita utilization of milk on a fats-solids basis. On a milk-equivalent basis, per capita civilian disapppearance of milk used in all dairy products in 1964 was down more than 13 percent from 1950. Milk-fat consumption was down 21 percent and consumption of milk solids-not-fat was down 4 percent. (2) [1]

The sharper decrease for milk fat reflects growing consumer preference for less milk fat in dairy products in recent years. Among frozen desserts, consumption of ice milk--a low-fat product--has increased over fivefold since 1950. Low-fat milk also has been gaining rapidly in consumer acceptance. In one survey, it was estimated that sales of low-fat milk could reach 1.8 billion quarts by 1970--a threefold increase over estimated sales in 1963. (6) This is a marked change from earlier years when there was a stronger consumer preference for milk of relatively high milk fat content.

The declining trend in per capita consumption, especially of milk fat, has created serious problems for dairy farmers because of the difficulty of producing milk of specified fat content, or of shifting to alternative enterprises.

THE RESEARCH PROBLEM

The American Dairy Association, a voluntary organization supported by dairy farmers, has been the major group promoting dairy products on a nonbrand basis. Dairy farmers make contributions to their State associations on the basis of hundredweight of milk sold. The State associations transfer most of these funds to the national organization, which has the responsibility for executing a national promotional program and for providing assistance on a local basis. The budget of the American Dairy Association was about $7.5 million in 1964.

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[1] Underscored numbers in parentheses refer to items in Literature Cited, p. 21.

The specific objective of the study reported here was to determine whether increased promotional expenditures by the Association would increase sales of fluid milk enough to justify the added cost. Fluid milk was selected because it yields a higher net return to producers and is the major outlet for both milk fat and solids-not-fat, accounting for about 40 percent of total utilization of milk fat and over 60 percent of total utilization of solids-not-fat, and because of the continuing decline in consumption of fluid milk. Also, producers of fluid milk had been asking for such market tests.

Fluid milk is a long established and widely distributed product and is quite familiar to consumers. It has a low elasticity of demand with respect to price and income, suggesting rather stable consumer purchasing patterns. Considering these conditions, it appeared likely that only a small change in sales could be expected from the promotion. Therefore, a primary criterion in designing the research was to be able to statistically measure a 2-percent change in sales volume with 95-percent confidence.

Generally it is very difficult to measure and account for a change as small as 2 percent when analyzing data on purchase behavior of consumers. Purchase patterns are often quite erratic and unpredictable. Measurement is further complicated by the dynamics of the marketplace. Exit and entry of firms into the market and accompanying changes in competitive behavior, changes in population, and fluctuations in general economic conditions are but a few of the factors which can influence purchase behavior of consumers.

LEVELS OF EXPENDITURE TESTED

One of the main considerations in formulating the research plan concerned the levels of promotion expenditure to be tested. It was desirable to test as many levels of expenditure as possible to gain some idea of the promotional response function and the optimal level of promotional expenditure. But because of budget limitations of the Association for the research, it was necessary to restrict the test to the current level of expenditures and two additional levels. While this approach would not provide enough observations to precisely specify the promotional response function, it would give evidence as to which of the two levels was optimal.

A related question was how much of an increase over the current annual expenditure of 2 cents per capita should be tested. On the one hand, the increases should be large enough to provide a fair test of whether sales could be increased. On the other hand, for the findings to have practical application the increases should not exceed amounts which the Association reasonably could be expected to sustain under typical operating conditions. The increases finally selected were 15 cents and 30 cents per capita on an annual basis. These increases are equivalent to roughly 4 cents and 7.5 cents per hundredweight of producer milk in a typical market, and were considered by the Association to represent realistic goals. With these levels of expenditure and the magnitude of the budget, it was possible to use six markets in conducting the study. 2/

USE OF MARKET ORDER DATA

Regularly published data on sales of milk in Federal and State Milk Order Markets were used in the background analysis for the study and also in conducting the actual experiment. First, these data represent a completed enumeration of milk sales in each market and would eliminate the need for working with sample data, which would be an additional source of unexplained variation. And second, these data are an economical source of information. The costs of collecting data from the size of sample required to measure a 2-percent change in sales would be prohibitive.

Before starting fieldwork connected with the research, it was necessary to determine whether it was feasible to measure a 2-percent change in sales resulting from promotion. Sales data from Federal and State Milk Order Markets covering the period 1959-61 were analyzed to determine factors associated with variations in milk sales. The analysis revealed that variations in milk sales for the periods studied were largely determined by differences associated with individual markets, such as size of population and consumption habits, and with season of the year. In most cases, these two factors accounted for over 99 percent of the variation in milk sales. In the markets finally selected for the study, these factors accounted for 99.9 percent of total variation in milk sales for the 2 years prior to the study.

THE LATIN SQUARE DESIGN

The Latin Square Design is well suited for dealing with problems where two factors account for the major source of variation in sales. The special features of the design are shown in the accompanying table (table 1).

First, as was noted earlier, three levels of expenditure were of interest to the Association--normal annual expenditures per capita and expenditures of 15 cents and 30 cents above normal. In table 1, these three expenditure levels have been applied at random to cities and time periods, with the restriction that each level appears once in each city and once in each time period.

With this restriction, each expenditure level appears in all of the markets. Therefore, sales at all promotional levels are subjected to whatever peculiarities of milk consumption are associated with each of the markets.

2/ Milk producers' associations in the test markets helped finance the additional promotional expenditures.

Table 1.--3X3 Latin Square for three treatments

Time period	Square I		
	Chattanooga	Knoxville	Rochester
1	A	B	C
2	B	C	A
3	C	A	B

Expenditure levels:
A = Normal promotion (approximately 2¢ per capita annually).
B = Medium promotion (15¢ per capita annually above normal).
C = Heavy promotion (30¢ per capita annually above normal).

Table 1 also shows that each expenditure level was in effect during each 6-month time period. All expenditure levels were tested both in seasons of high consumption and in seasons of low consumption. This insured that no level of expenditure would enjoy an advantage over the others because it happened to be tested when consumption of milk was at seasonal peaks. This design was further refined, as is illustrated later in the report.

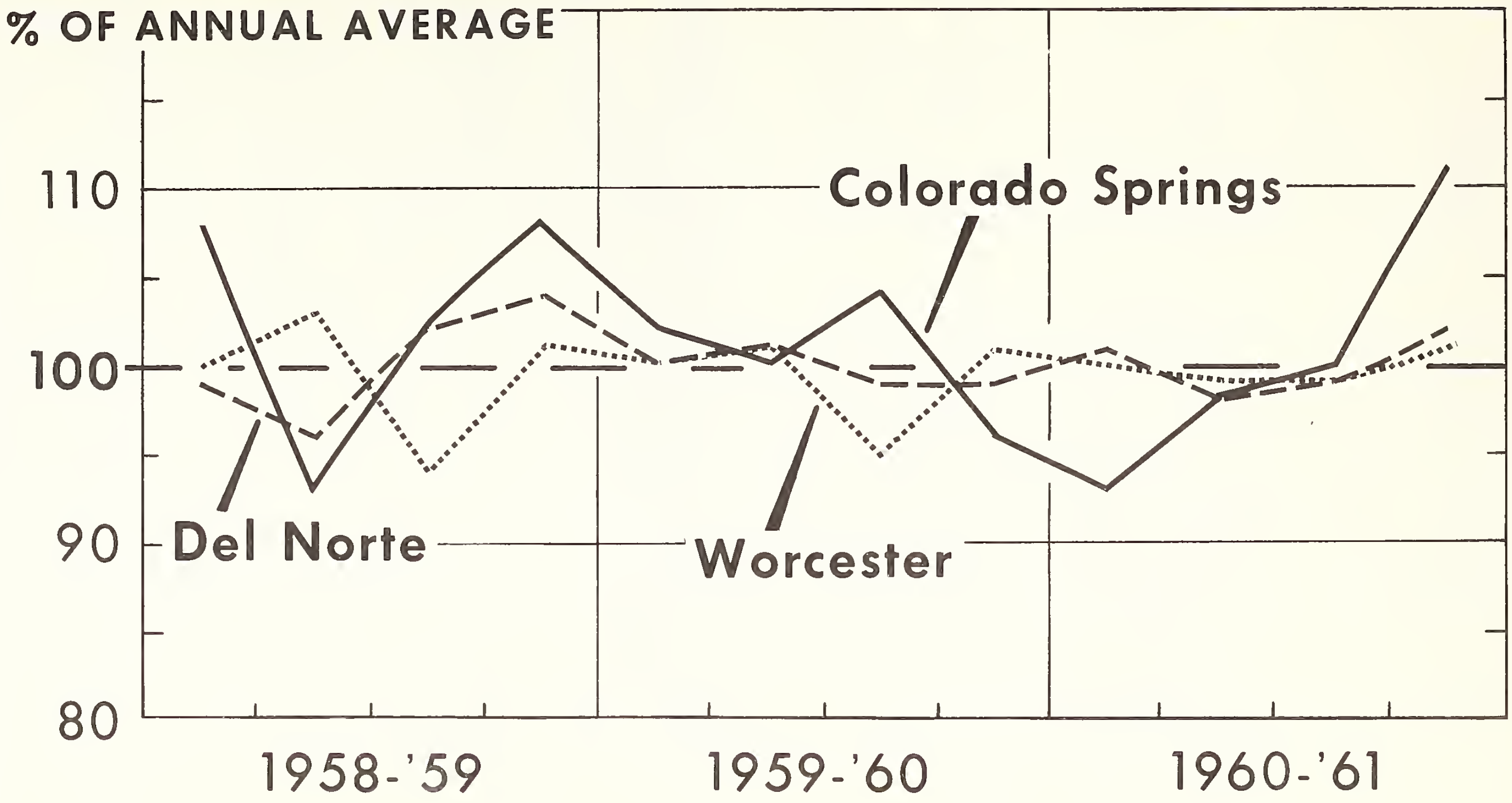
SELECTION OF MARKETS

Several criteria were established in selecting markets that would be suitable as test markets. A major one was that markets be selected so that the basic assumptions of the design would be met. The design assumes that time effects are constant over cities and that city effects are constant over time. These assumptions imply that the seasonal sales patterns among cities are similar and that seasonal patterns of consumption within cities are stable from year to year. The historical data from Federal and State Milk Order Markets were used to select markets that would meet these assumptions reasonably well.

The graphic analyses shown in figures 1 through 3 reflect the suitability of markets for the experiment. The three markets shown in figure 1 did not meet the condition of constant time effect or uniform sales patterns among markets. The graph shows that during particular time periods sales were increasing in some markets and decreasing in others. In this case, the time period would not affect sales at all promotional expenditure levels in the same way. These markets, therefore, were unacceptable as experimental units.

Figures 2 and 3 show the sale patterns in the markets that were finally selected for the experiment. The sales patterns in these markets are considerably more uniform between cities and over time.

FLUID MILK SALES IN COLORADO SPRINGS, WORCESTER, AND DEL NORTE, BY QUARTER



QUARTERS: DEC.-FEB.; MAR.-MAY; JUNE-AUG.; SEPT.-NOV.

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Figure 1

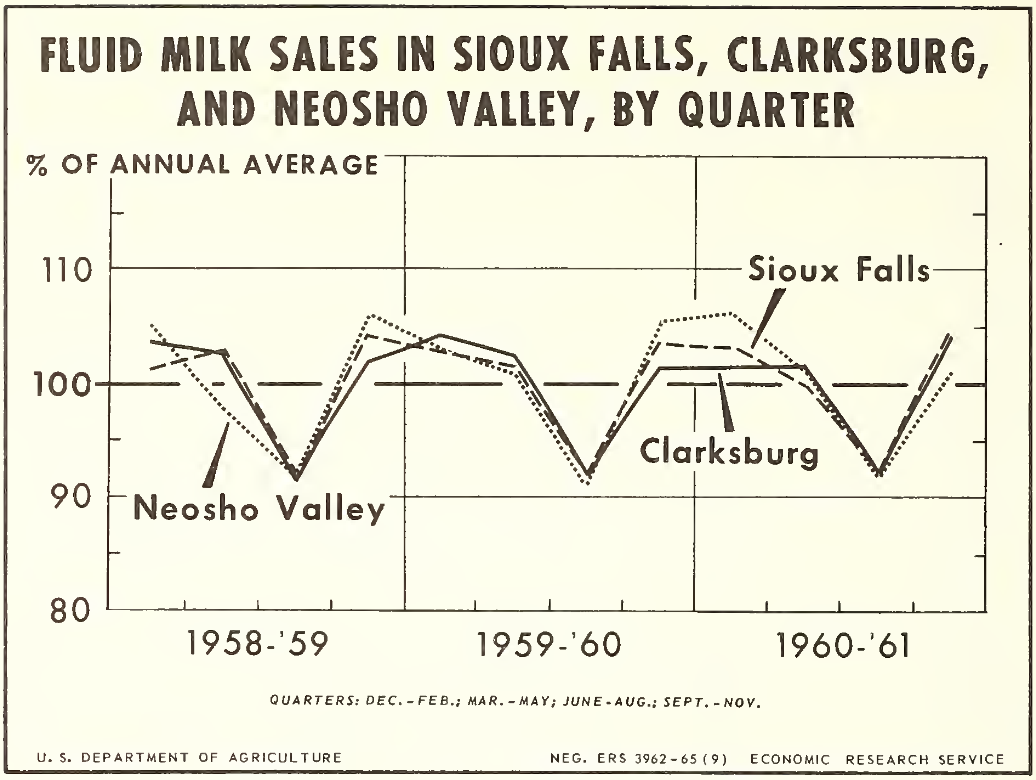

Figure 2

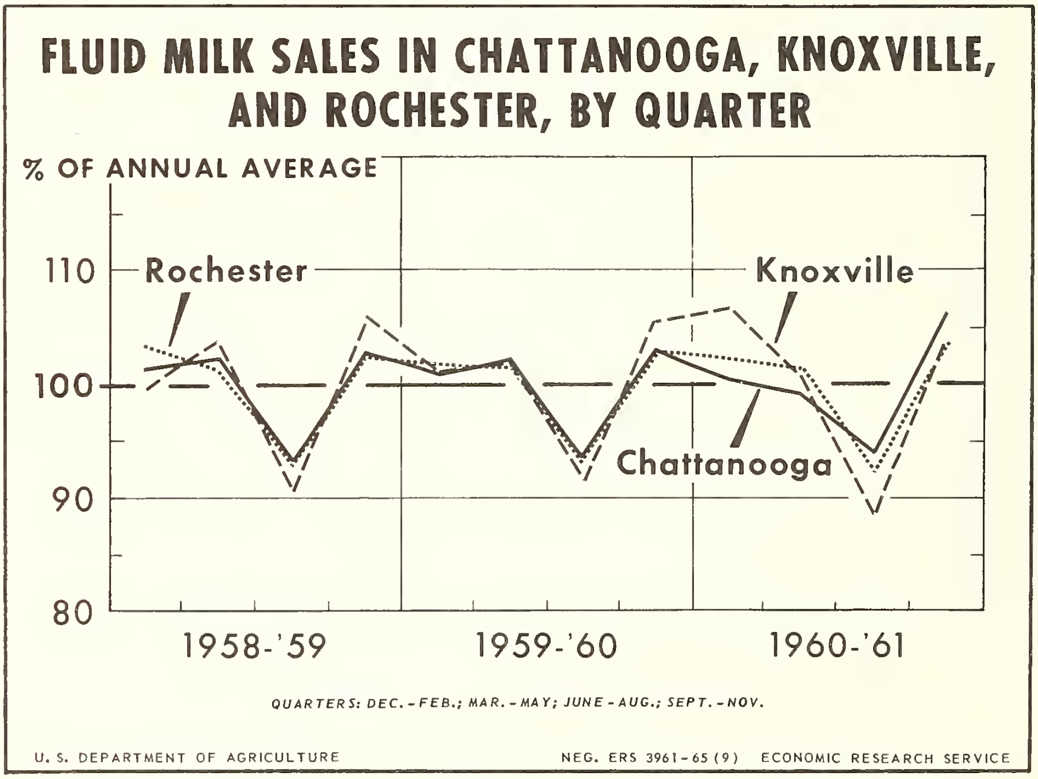

Figure 3

Also in the selection process, Milk Market Administrators or their assistants were interviewed in some 25 markets to obtain information on reliability of the data and a history of milk marketing patterns. Markets with a history of upheavals in marketing conditions and consumption patterns were eliminated as possible test markets. The primary focus in determining the reliability of data was on the methods of collecting and auditing sales records of milk handlers. The objective was to insure that all movement of milk into and out of the defined areas was accounted for. Our definition of accuracy was an error of no more than 1 percent as verified by actual audits.

Another requirement was that the area covered by the advertising media approximate or match the area covered by the sales data. While it was not possible to match the areas exactly, this requirement was met reasonably well. In two markets this was done by collecting data on sales beyond the normally defined milk marketing area. A related consideration was that the test markets be selected so that the media coverage in one market did not overlap in another market.

Since promotional expenditures were made on a per capita basis, it was necessary to restrict the size of the markets used to keep total promotional outlays within budget allotments. Therefore, another criterion was that the population of a market should not exceed 600,000 by a significant amount. Within this framework, six markets of varying sizes were selected, ranging from a population of 80,000 to slightly over 600,000. They were Chattanooga and Knoxville, Tenn., Rochester, N.Y., Sioux Falls-Mitchell, S.Dak., Neosho Valley in Kansas and Missouri, and Clarksburg, W.Va.

These markets were also chosen so as to provide a cross section of the Nation's population and economic conditions. For example, annual per capita consumption of whole and skim milk varied between markets from 243 pounds to 368 pounds. Per capita income varied from about $1,900 to $2,700. Similarly, unemployment rates varied between markets from under 2 percent to as much as 9 percent. Thus when the sales promotion programs were rotated over these markets, they were subjected to a broad cross section of economic conditions and personal tastes and preferences. It should be kept in mind, however, that notwithstanding efforts to achieve the broadest possible representation, the study was a controlled experiment which was not replicated over all possible market environments. This must be recognized in interpreting the implications of the results.

THE PROBLEM OF CARRYOVER INFLUENCE

One of the important considerations in a study of effectiveness of sales promotion is the question of carryover of effect beyond the period in which the expenditure is actually made. The carryover influence has been described by Fred Waugh by a decay curve in which the effect of a promotional input or expenditure gradually diminishes over time (7). This characteristic of the promotional effect requires certain refinements in the measurement technique. Provisions must be made for measuring the immediate influence plus the influence which continues in subsequent periods after the expenditure has been made.

Two alterations were made in the basic Latin Square Design to deal with the problem of carryover influence. First, the design was altered to a double changeover design in which the treatment sequence is reversed in the second square (table 2). Second, a fourth time period was added. With this arrangement, each promotional expenditure level is preceded by itself and every other expenditure level in the study. As before, the capital letters in the table represent the expenditure levels. The corresponding small letters in parentheses represent the sales of markets having these expenditure levels in the previous period. The analysis of sales associated with these small letters provides an indication of the carryover influence. The carryover influence could be estimated with only three periods but the addition of the fourth period allows every expenditure level to follow itself and adds precision to the estimate of the carryover effects.

Table 2.--Experimental design to measure carryover effects

Time period	Square I			Square II		
	Chattanooga	Knoxville	Rochester	Clarksburg	Sioux Falls	Neosho Valley
1	A	B	C	A	B	C
2	B (a)	C (b)	A (c)	C (a)	A (b)	B (c)
3	C (b)	A (c)	B (a)	B (c)	C (a)	A (b)
4	C (c)	A (a)	B (b)	B (b)	C (c)	A (a)

Expenditure levels:
A = Normal promotion (approximately 2¢ per capita annually).
B = Medium promotion (15¢ per capita annually above normal).
C = Heavy promotion (30¢ per capita annually above normal).

The exact length of the carryover influence was not known. As a further precaution, therefore, promotion during each time period was concentrated into the first 3 months rather than being spread over the entire 6-month period. This permitted a 3-month washout period of no promotion in each market before shifting to a new level of expenditure. Thus in effect, 9 months were allowed for dissipation of the carryover influence.

UNIFORMITY TRIALS

As a test of the design, historical data covering the 2-year period March 1959 through February 1961 were fitted into the design and analyzed as though the experiment was actually run. 3/ Actual sales data were converted to logarithms, because the magnitude of seasonal sales fluctuations in each market was proportional to the mean. The results are shown in table 3. Markets and time periods are shown to be the statistically significant sources of variation in milk sales accounting for practically all of the variation.

Table 3.--Analysis of variance of fluid milk sales in six markets--uniformity data, March 1959 through February 1961 1/

Source of variation	Sum of squares	Degrees of freedom	Mean square	F ratio	Percent of total variation
Total	1.635895	23			100
Between squares . . .	1.172811	1	1.172811	4927.78	71.7
Periods within squares	.006734	6	.001122	4.71	.4
Between periods . . .	.006460	(3)	.002153	9.05	
Periods X squares . .	.000274	(3)	.000091	.38	
Markets within squares	.454376	4	.113594	477.29	27.8
Effect of treatment:					
Direct	.000045	2	.000023	.10	.0
Carryover	.000025	2	.000013	.05	.0
Error	.001904	8	.000238		.1

1/ Original data converted to logarithms.
Coefficient of variation = 0.5 percent.

The uniformity data were also analyzed to determine whether the analysis would show a significant difference between treatments or expenditure levels when in fact no additional promotion by producers was in effect. The purpose was to gain further evidence as to the random or unaccounted-for variation in milk sales. Table 3 indicates that treatment differences are nonsignificant, as shown by F ratios of 0.10 and 0.05. This was expected, since this was a simulated experiment and the level of promotion associated with each treatment was the same. The mean values of sales for all three treatments were nearly identical, as shown in table 4. If these mean values had differed significantly, serious doubts would have been raised as to the validity of the research design.

3/ For a more detailed description of the analytical techniques employed in this design, see (4), (5), and (6).

Unexplained or random variation, as reflected in the error term of table 3, was only 0.1 percent of total variation. The experimental error expressed as a coefficient of variation was only 0.5 percent. Similar results were obtained when several other combinations of markets were analyzed on the same basis. These analyses suggested that it was feasible to meet the requirement of detecting a 2-percent change in sales with 95-percent confidence.

Table 4.--Effects of treatments on sales of fluid milk: Analysis of uniformity data for Chattanooga, Knoxville, Rochester, Clarksburg, Sioux Falls, and Neosho Valley Order Markets, March 1959 through February 1961

Treatment	Average sales per day
	1,000 pounds
A	282
B	284
C	283

Simulated expenditure levels:
A = Normal promotion.
B = Medium promotion.
C = Heavy promotion.

PROCEDURE

The experiment was initiated in March 1963 and continued for a period of 2 years, ending in February 1965. Nearly all types of media were used in the advertising, including radio, television, magazines, newspapers, and billboards. However, additional expenditures for the medium and high levels of promotion were limited to television, newspapers, and billboards to minimize the possibility of media overlapping among markets. 4/ In addition, instore and home delivery promotional materials and methods were employed. The media mix was not held constant from market to market, although promotion themes remained the same. In each market, the Association purchased what it considered to be the best media mix in light of the available budget and media for that market. Although one could argue with this approach, it was felt that it was most representative of what would be done in a practical situation, and thus would be most meaningful to the industry.

4/ This was necessary to maintain control of promotional intensity in the various markets. For example, it would have been difficult if not impossible to have one level of advertising intensity in magazines and radio in Chattanooga and another level of advertising intensity in these media in Knoxville.

Except for two markets--Chattanooga and Knoxville--each test market area was the same as the area defined by the Federal or State Milk Order. For Chattanooga and Knoxville, the test market areas were extended beyond the Federal Order Market so that the area covered by the sales would more nearly match the area covered by the promotion media.

As indicated earlier, the sales data were obtained from Milk Market Administrators in each of the markets. These data represent fluid whole, low-fat, and skim milk and other skim milk items included in Class I uses sold by milk handlers direct to consumers, retailers, and institutional outlets. In addition, enumerators were employed in each market to obtain other data which might prove relevant to the study. Enumerators made weekly visits to a sample of retail food stores to obtain information on prices charged for milk, the types and quantities of display materials used, and the amount of display space allotted. They also audited newspaper advertising of milk by retailers and milk distributors.

Information was also collected on other factors which might affect milk consumption--level of employment, school enrollments, and quantity of milk sold under the school lunch program. This was done to determine whether significant changes in these factors occurred between treatments, and to serve as a basis for correcting the sales data through covariance analysis if significant change should occur.

Changes did take place in some of these in one market. The entry of a new firm (handler) in the Knoxville market about the middle of the third time period (a period of normal promotion) caused a disturbance in the sales of fluid milk. During the first 3 months of the period, the average daily sales level equaled expected sales for the season in this market with normal promotion. However, on entry of the new firm, which was accompanied by intensified sales effort and some price cutting, sales increased significantly above expected levels. Therefore, sales for the last part of the third time period and for the fourth time period were adjusted for the influence of these variables which could not be controlled. Two alternate methods for correcting the sales data were examined: (1) calculation of missing values as described by Lucas for the extra-period Latin Square changeover design, which employs sales data for all the other cells in the design (5); and (2) covariance adjustments for the effect of price and of advertising by handlers. Calculation of missing values resulted in sales estimates of 419.3 pounds per day for the third time period and 444.6 pounds per day for the fourth time period. The covariance adjustments resulted in sales estimates of 390.5 and 415.4 pounds per day respectively for the third and fourth time periods--significantly lower than estimates obtained by the missing-value calculations. While these estimates were in line with the relative performance of normal promotion (adjusted for seasonality) in other markets, their use would have resulted in greater differences in the average sales response to the B and C levels of promotion compared to the A level, as the average daily sales for the B and C levels were greater than for A before any corrections were made. Therefore, the missing-value estimates were employed in subsequent calculations as they were the more conservative of the two estimates. The net effect of this adjustment was to lower the average daily sales per market (sales before adjustments for the residual sales effect of treatments) of A by about 450 pounds.

SALES RESULTS

Sales results are broken down into two parts--direct effect and residual effect. The permanent or total effect of a given level of promotion is considered to be the sum of the direct effect plus the residual effect--the carryover influence into the next 6-month period.

The analysis of variance of the experimental data revealed that the direct effects of different levels of expenditure varied to a statistically significant degree. The magnitude of the F ratio (10.16) in table 5 shows that the variation in sales associated with the three promotional levels was over 10 times the experimental (or sampling) error. The probability of obtaining a ratio of this magnitude from chance fluctuation (as in the uniformity analyses) is less than 1 in 100. Thus we can say with 99-percent confidence that the immediate sales response was different for the three levels of promotional expenditures. For comparative purposes, table 5 also shows the F ratio obtained from the simulated experiment discussed earlier. The comparisons show an F ratio of 10.16 for the experimental data and only 0.10 for the uniformity data.

The analysis revealed that carryover effects were also significant, as shown by an F ratio of 5.5. The probability of obtaining a ratio of this magnitude where no actual differences existed was less than 5 in 100. These analyses, of course, do not tell which specific treatments differed from each other--only that significant differences existed.

Table 6 shows the amount of sales produced by the direct effect and the carryover effect of each treatment, and whether the amounts were significant. The direct effect of the medium level of promotion was to increase milk sales by 8,000 pounds per day per market; heavy promotion increased sales by 10,000 pounds per day. Both of these increases are highly significant (table 6).

Residual or carryover influences of both levels of promotion increased sales to a statistically significant degree. The increases were 5,000 pounds per day per market with the medium level of promotion and 7,000 pounds per day with heavy promotion.

The combined effects of the promotional expenditures (direct plus carryover) were a 4.5-percent increase in sales with medium levels of promotion and a 5.9-percent increase with heavy levels of promotion. Both increases are significant at the 0.005, or one-half of one percent, probability level. In other words, there was less than 1 chance in 200 that differences as large as these resulted from random variation.

Other analyses were performed to determine whether the sales response to levels of promotional expenditures varied significantly among markets and time periods; that is, whether the difference between actual sales and expected sales for a particular market and time period at specific levels of expenditure were greater than could be expected from chance. Results of these analyses showed that percentage sales increases for the intensified promotion in the various markets and time periods did not vary from expected increases by an amount that would exceed random or chance variations.

Table 5.--Analysis of variance of fluid milk sales in six markets during promotion, March 1963-February 1965 1/

Source of variation	Sum of squares	Degrees of freedom	Mean square	F ratio (experiment)	F ratio (uniformity data)
Total	1.724089				
Between squares . .	1.295240	1	1.295240		
Periods within squares	.006473	6	.001079		
Between periods . .	.006347	(3)	.002116		
Periods X squares .	.000126	(3)	.000042	1.1	
Markets within squares	.420878	4	.105220		
Between markets . .	.226032	(2)	.113016		
Promotion effect:					
Direct	.000772	2	.00386	**10.16	.10
Carryover	.000419	2	.00210	*5.53	.05
Error	.000307	8	.000038		

1/ Data converted to logarithms.
* Significant at 5-percent level.
** Significant at 1-percent level.

Table 6.--Effect of three levels of promotional expenditures on sales of fluid milk in six markets, March 1963-February 1965

Components	Sales per day with normal promotion	Medium Promotion		Heavy Promotion	
		Sales per day	Increase over normal	Sales per day	Increase over normal
	Thou. lbs.	Thou. lbs.	Thou. lbs.	Thou. lbs.	Thou. lbs.
Direct effect . .	288	296	**8	298	***10
Carryover	---	1/ 5	*5	1/ 7	**7
Combined effect .	288	301	***13	305	***17

1/ Adjusted to zero carryover for normal.
* Significant at 5-percent level.
** Significant at 2-percent level.
*** Significant at 0.5-percent level.

RETURNS TO PRODUCERS

The most important question is, what do these gains in sales volume mean in terms of revenue to farmers? More specifically, were the gross dollar returns from gains in volume of milk sold large enough to justify the added cost of promotion?

In computing returns to producers, it was assumed that added fluid sales consisted of milk that would have otherwise gone into manufacturing Class II uses. Therefore, the added income to farmers would be the difference between Class I and Class II prices multiplied by the increased quantity of fluid milk sold.

The price differential used in computing gains in revenue was $2.10 per hundredweight. This figure was determined by weighting the price differential in each market (ranging from $1.40 to $3.00 per cwt.) by the volume of sales in that market.

Other prices could have been used in determining the price differential. For example, the use of Government support prices would have resulted in a larger price differential than the one used (1). Another alternative would have been to arrive at a Class I price by adding to the Class I base price for 3.5-percent milk the Class II premium for 0.1 percent of butterfat of producer milk deliveries exceeding the 3.5-percent base. This assumes that all excess butterfat above the 3.5-percent base was utilized in Class II uses. Using this procedure, the weighted price differential for the six markets would have been $2.06 per hundredweight instead of $2.10. None of these alternatives take into account flexible adjustments in classified pricing designed to discourage surplus production. That is, as the percentage of total milk receipts going into Class I uses increases, the differential between Class I and Class II prices also increases.

Using the price differential of $2.10 per hundredweight, it is estimated that the medium level of promotion increased gross receipts of farmers in the six markets by about $398,600 and the heavy level of promotion increased gross receipts by about $521,200 (table 7). The cost of achieving this added income was about $237,500 for medium promotion, and nearly $436,400 for heavy promotion. This increase in gross receipts includes an allowance for carryover effect into the first 6 months after the experiment was completed.

The estimated net returns for the medium and heavy promotion were approximately $161,000 and $85,000 respectively. Thus the 15 cents per capita was the optimum outlay, with net profits declining when expenditures were increased to 30 cents.

It should be noted that the net returns on the added promotional investments depend on the difference between Class I and Class II prices received by producers for milk delivered. For the cities in this study, the weighted break-even price differential (price that will equate gross revenue and cost for added sales volume) was $1.32 per hundredweight for the medium level of promotional expenditure and $1.85 per hundredweight for the heavy level. The break-even price would vary among markets depending upon per capita promotion cost and per capita consumption (a fixed percentage increase when applied to 200 pounds consumption per capita would yield a much greater return than when applied to 100 pounds consumption per capita).

Table 7.--Costs and returns of promotion in six markets, March 1963-February 1965

Level of promotion	Cost of promotion	Increased sales	Net returns
	Dollars	Dollars	Dollars
Medium	237,530	398,580	161,050
Heavy	436,363	521,220	84,907

One might be tempted to connect the three observed points with some type of smoothe curve and to interpolate the net profits at intermediate points, such as 7 cents and 20 cents expenditure per capita. The fitting of such a curve would be risky in light of the available data. Net profits may be still higher at some point between 15 and 30 cents or they may be higher at some point between 2 and 15 cents. Thus all that can be said is that, of the increases considered, 15 cents per capita is the level that optimizes net profits in the short-run situation.

TRADE PARTICIPATION IN PROMOTION

A part of the regular promotional effort of the American Dairy Association is directed at obtaining trade support, because of the important role that members of the trade play in influencing the behavior of consumers. Data were obtained from handlers and retail food stores in each of the markets to determine whether their promotion and merchandising practices were affected by the different levels of promotional expenditures. Table 8 indicates how some of the merchandising activities of retailers varied with different levels of promotion.

The main change was in the display of instore merchandising materials at the point of purchase. Point-of-purchase materials displayed in the store increased 32 percent during the medium level of promotion and over 85 percent during heavy promotion.

Table 8.--Merchandising activities for milk of retail food stores during different levels of promotion, by type of merchandising activity

Merchandising activity	Level of promotional expenditure		
	Normal	Medium	Heavy
	Squares inches		
Display space per store	2,408	2,236	2,388
Point-of-purchase material displayed	870	1,151	1,624
Newspaper advertising per month, per paper	7.4	5.2	11.3

Nearly 60 percent of the pieces of point-of-purchase material observed in retail stores were sponsored by the American Dairy Association. Milk handlers were also active, sponsoring about one-third of the pieces displayed (table 9). The use of point-of-purchase materials was greatest in the Chattanooga market, with an average of about 7 pieces used per store. Use in the Rochester market was substantially lower than in the other markets, averaging slightly over 2 pieces per store. The main types of promotional materials displayed were case strips and overwires, both being about equally important (table 10). There was no significant association between the amount of display space retailers allotted to milk and the level of promotion. Newspaper advertising by retailers was very slight. This is not surprising, as most retailer advertising features price reductions, not a common practice in the sale of milk.

Handlers were interviewed in each market to obtain information on their promotional procedures and practices and on whether these practices were affected by the promotional program. The objectives were to determine (1) whether the promotional program of the Association caused handlers to increase or decrease their promotional efforts, (2) the kinds of promotion for which any changes in expenditures were made, and (3) how the Association's promotional approach might be improved to better fit in with the activities of handlers. To obtain this information, each handler was interviewed three times, with each interview following a period of medium or heavy promotion.

Some attention was given in the interviews to the question of how handlers determined the size of the advertising budget. Responses indicated that the most common practice was to establish the budget as a percentage of sales. Twenty-one out of 40 handlers reported using this technique. The handlers who reported using this method generally were the larger independent handlers and handlers affiliated with national distributors.

Table 9.--Average number of pieces and square inches of point-of-purchase material displayed per store, by market and sponsor of material, March 1963-February 1965

Market	American Dairy Association		Milk handlers		Retailers		Total	
	No. of pieces	Square inches	No. of pieces	Square inches	No. of pieces	Square inches	No. of pieces	Square inches
Chattanooga.	4.4	968.8	2.2	725.4	0.4	231.9	7.0	1,926.1
Knoxville...	2.0	538.1	1.6	290.0	.2	105.0	3.8	933.1
Rochester...	1.1	467.4	1.2	174.6	.1	19.3	2.4	661.3
Clarksburg	2.6	583.4	1.4	749.1	.02	17.5	4.0	1,350.0
Sioux Falls	2.8	690.8	0.6	201.3	.1	98.6	3.5	990.7
Neosho Valley	2.1	527.6	1.5	406.4	1.6	487.2	5.2	1,421.2
Average..	2.5	629.3+	1.4	424.5	.4	159.9	4.3	1,213.7

Table 10.--Average number of pieces and square inches of point-of-purchase material displayed per store, by market and type of material, March 1963-February 1965

Market	Overwire		Case strips		Blackboard wobblers		Posters		Other	
	No. of Pieces	Square inches	No. of pieces	Square inches	No. of pieces	Square inches	No. of pieces	Square inches	No. of pieces	Square inches
Chattanooga..	2.2	927.4	2.6	155.4	0.5	12.8	1.0	470.2	0.7	360.3
Knoxville....	1.5	565.4	1.1	40.5	.2	7.2	0.6	245.7	.4	74.2
Rochester....	0.8	425.2	1.0	72.6	.1	4.4	.5	154.4	.02	4.6
Clarksburg...	1.4	475.8	1.4	132.6	.3	6.3	.8	246.5	.2	488.8
Sioux Falls..	1.1	475.8	1.4	117.2	.4	12.1	---	4.2	.6	381.4
Neosho Valley	1.1	701.7	2.0	126.8	.4	8.7	.2	69.3	1.5	514.6
Average	1.3+	595.2	1.6	107.5	.3	8.6	.5	198.4	.6	304.0

Other responses indicated that advertising expenditures were more or less determined by judgment. Typical responses obtained in this category were "we play it by ear," "it depends on how we feel," and "it depends on the funds available or how much we think we can spend." There were no responses which indicated that expenditures were made on the basis of expected returns from the outlay. Perhaps this was because in many instances not much is known about the real effects of promotion and its impact on profits.

Some respondents, especially those basing budgets on a percentage of sales, indicated that setting the budget was a fairly routine matter except during periods of substantial change in the competitive market situation. Some respondents indicated that changes in the competitive situation, such as the activities of competitors in the market, or a sharp slip in their share of the market, was the major factor that would cause an increase in the percentage of sales allotted to advertising.

Handlers supplying data on their total promotional expenditures were asked whether they increased their expenditures during periods when the Association was promoting sales.

Total expenditure does not appear to be positively related to different levels of expenditure by the Association (table 11). Analysis of variance did show a significant difference among handlers in levels of promotional expenditure, but this did not follow the patterns of expenditure by the Association. One possible reason for this is the increased handler promotion that took place in Knoxville during the Association's normal promotion. The data are further limited because expenditures for promoting sales of fluid milk in many instances could not be separated from the total. Therefore, shifts of funds from other products to fluid milk would not be reflected. Audits of actual newspaper advertising for fluid milk indicated that handlers increased their promotion by 40 percent during the medium level of promotion and about 58 percent during heavy promotion. Thus it appears that handlers increased their advertising expenditures for fluid milk by shifting funds from other products or from other forms of promotional activity.

In response to the direct question of whether they increased their promotional expenditures during the 2 years covered by the Association's promotion program, 7 out of 40 handlers answered that they did so. Two of these handlers who reported expenditures by product classes reported increased expenditures for fluid milk of about $3,700. The five remaining handlers reported, in total, increased expenditures of over $12,000 for all products sold by the firms, but they could not give a breakdown of how much of the increase was spent on fluid milk. The combined increases appear to be about 6 percent of their normal promotional expenditures.

Four out of 42 handlers interviewed indicated that they increased promotional expenditures during the period of heavy promotion by the Association. The combined expenditure increases of these handlers during periods of heavy promotion over the 2-year period totaled $3,100, a relatively small amount when viewed against the total expenditures of all handlers (about $720,000).

Table 11.--Newspaper advertising for fluid milk and total promotional expenditures by milk handlers during various levels of promotion by the American Dairy Association

Merchandising activity	Level of expenditure		
	Normal	Medium	Heavy
Newspaper advertising per paper per month (square inches)	589	820	931
Promotional expenditures per month per market for all products sold 1/ (dollars)	13,663	13,062	15,016

1/ These figures represent total expenditures by milk handlers for all products, since in many instances expenditures for fluid milk could not be separated from ice cream, cheese, and other dairy products. Total normal level expenditures would have been lower had it not been for the intensified promotional activities in Knoxville during normal promotional periods.

It should be pointed out that promotional expenditures do not represent the full extent of the participation of handlers in the promotion program. Almost all indicated that they supported the program by distributing and putting up the Association's point-of-purchase materials.

The reasons most frequently given by handlers for not increasing expenditures was that their budgets were fixed and could not easily be varied. These were the larger independents and those handlers affiliated with national organizations. Generally, these organizations set up their promotional plans once a year, deciding how much will be spent in each month and what will be promoted. This inflexibility in promotion expenditures necessitates considerable advance planning.

A second problem with national dairies is that the local advertising manager has limited flexibility in developing a promotional program for his market. The regional or national office is apt to play the major role in formulating the promotional program for each market. There is a general fund available to the local manager, but this is rarely drawn upon unless there are unusual developments such as a sharp slip in market share in one of the local areas. It appears, therefore, that national-regional-local coordination is essential in order to achieve greater trade participation at the local market level.

Other reasons given for not increasing expenditures were "can't afford it," "not interested," or "too busy." Some handlers gave no specific reason for not participating.

A few handlers made a special point of the fact that they contributed to their local promotional organization and felt that this was adequate participation. Also, a few handlers were very guarded in their statements and in the information they gave concerning their promotional activities--suggesting a keen competitive situation in their markets.

Especially among the smaller handlers, there did not appear to be a sharp sensitivity with respect to promotion as a management tool which could influence profits. These organizations either did not have or could not afford to employ a specialist to handle the promotion function. The company manager or a similar official frequently performed this task. With the pressure of other work, it seems likely that little time would be available to give careful thought to promotion.

All of the handlers interviewed in all markets stated that they did not shift the timing of their promotional activities in any way as a result of promotional activities of the Association. This is a natural consequence of inflexibility and other problems discussed earlier. Two handlers reported that they did rearrange media advertising already scheduled for the promotion period so that it would appear as nearly as possible on the same day as the Association's advertisements.

Even though relatively few handlers reported increased expenditures for media during the period of intensified promotion, a large number indicated that their own promotional activity was affected by the Association's program. The change consisted of increased emphasis on personal selling, merchandising, and public relations (table 12).

Handlers pointed out that these activities were accomplished by concentrating the efforts of their regular personnel rather than by incurring additional expenditures. The main activity in this respect was that of providing manpower support for Association merchandising materials.

Table 12.--Number of handlers giving increased emphasis to selected merchandising activities during various periods of promotion

Merchandising activity	Level of Promotion	
	Medium 1/	Heavy 2/
	Number	Number
Media advertising	10	4
Personal selling	7	5
Merchandising	26	27
Public relations	4	2
Other	1	3

1/ A total of 40 handlers were interviewed during medium promotion.
2/ A total of 42 handlers were interviewed during heavy promotion.

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